Bill Williams Watershed Water Quality Assessments

Watershed Description

The Santa Maria River and the Big Sandy River drainages merge at Alamo Lake to create the Bill Williams River, which connects to the Colorado River at Parker Dam. Land ownership is divided approximately as 45% federal, 28% state, and 27% private (no Tribal lands). With only 8,000 people (2000 census), this watershed does not have any large population centers. Open range grazing is the principal land use. A large mining complex is located in the Bagdad area, while historic mine sites are scattered throughout the watershed.

Elevations range from 8,417 feet (above sea level) at Hualupai Peak to 1,000 feet near the Colorado River. Most of the watershed is below 5,000 feet, with low desert fauna and flora (Sonoran Desert - Mohave Desert transition area) and warmwater aquatic communities where perennial waters exist.

Water Resources

There is little precipitation, from 13 inches a year, with an additional inch of snowfall per year in higher elevations, so surface water resources are sparse. Perennial flow in this watershed is frequently interrupted (short segments), even on the larger main-stem rivers. The largest lake, Alamo Lake, covers 11,950 acres; however, only an estimated 1,415 acres are perennial.

An estimate of surface water resources in the Bill Williams Watershed is provided in the following table**,** based on USGS digitized hydrology at 1:100,000, rounded to the nearest 5 miles or 5 acres.

Estimated Surface Water Resources in the Bill Williams Watershed

	Perennial	Intermittent	Ephemeral
Stream miles	185	655	5035
	Perennial	Non-perennial	
Lake acres	1832	11,950	

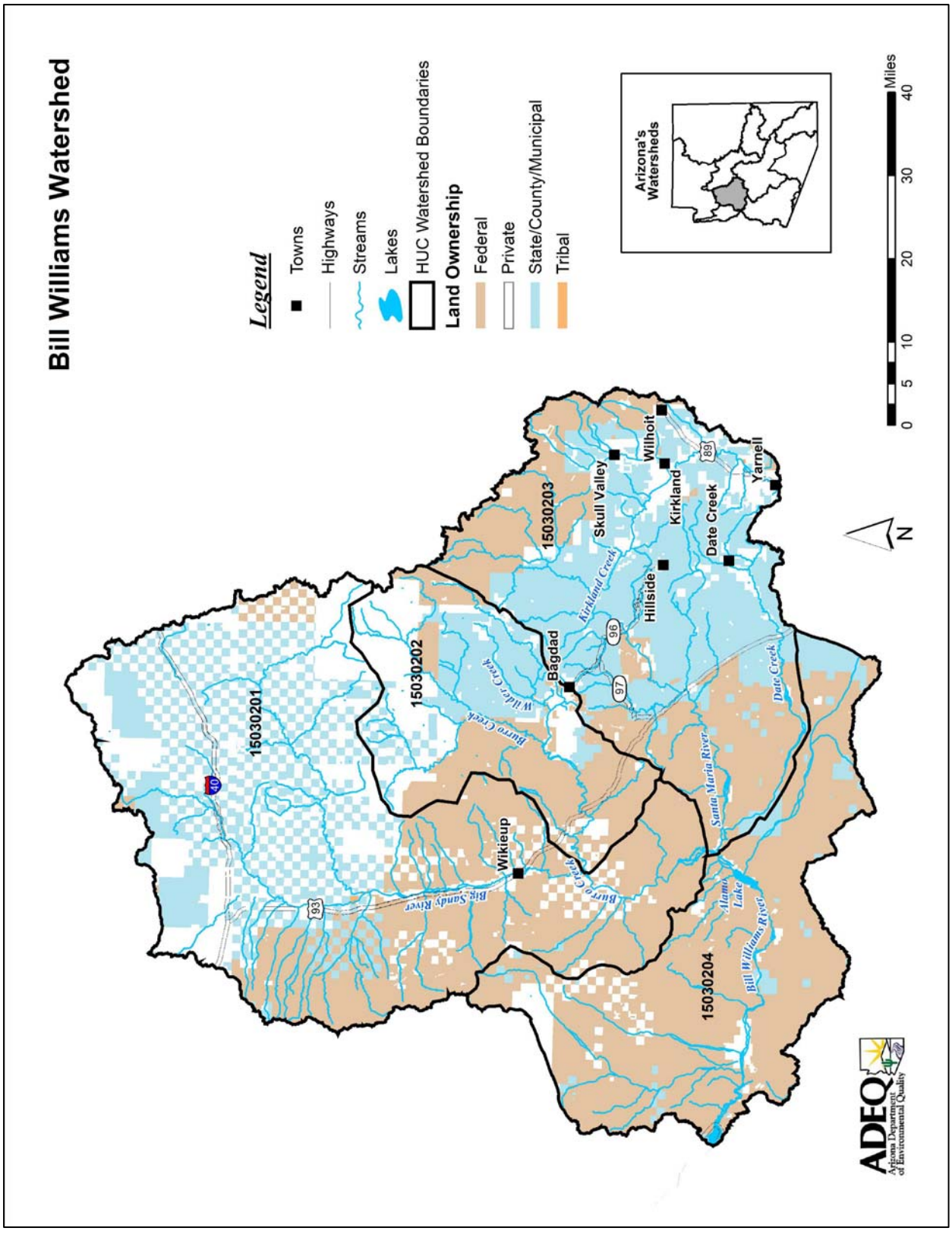
Ambient monitoring focuses on perennial waters; however, special investigations may identify water quality problems on intermittent and even ephemeral waters.

Watershed Partnerships

The following watershed groups are active in this watershed:

- Upper Bill Williams
  The watershed area of concern is approximately defined by Kirkland Creek's drainage area, a tributary to the Santa Maria River. The partnership's mission is to manage and protect water resources – water quality and water rights – and they advocate local control over water resources and land use. For information, contact Sondra Wilkening (secretary) at (928) 925-6434 or westwindsinc@yahoo.com, or Troy Suter at (928) 442-3885.

- Northwest Arizona Watershed Council
  Their area is defined by three groundwater basins: Hualapai Valley (in the Colorado-Grand Canyon Watershed), Sacramento Basin (in the Colorado-Lower Gila Watershed), and Big Sandy (in the Bill Williams Basin). The council's goal is to protect and preserve water resources and educate the public about water issues related to growth and development. The council meets on the 3rd Wednesday of the month in Kingman, AZ. For information, contact Elmo Roundy (928) 757-2818 or Earl Engelhardt at (928) 692-1068 or imspirit@kingmanaz.net.


Bill Williams Watershed
Legend
Towns
Highways
Streams
Lakes
HUC Watershed Boundaries
Land Ownership
Federal
Private
State/County/Municipal
Tribal
Arizona's Watersheds
Miles
0 5 10 20 30 40
N
15030201
15030202
15030203
15030204
Wikieup
Bagdad
Hillside
Skull Valley
Wilhoit
Kirkland
Date Creek
Yarnell
Big Sandy River
Burro Creek
Santa Maria River
Alamo Lake
Bill Williams River
Kirkland Creek
Date Creek
93
40
96
97
89
ADEQ
Arizona Department of Environmental Quality

Special Studies and Water Quality Improvement Projects

Total Maximum Daily Load Analyses – The following TMDL analyses have been completed, are ongoing, or are scheduled to be completed in this watershed. Further information about the status of these investigations or a copy of the TMDL, if completed, can be obtained at ADEQ's website: www.azdeq.gov.

- Boulder Creek, from Wilder Creek to Butte Creek, near Bagdad, is not attaining water quality standards due to arsenic, beryllium, copper, manganese, mercury, zinc and low pH. Boulder Creek, from Butte to Copper Creek is not attaining water quality standards for arsenic. Arsenic, copper, and zinc TMDLs were approved in 2004 and identified three tailings piles from the former Hillside Mine and a seep (spring) from a collapsed adit as the main contributing sources. A TMDL Implementation Plan was adopted in 2005 and identified encapsulation, grading, and capping of the tailings piles as the primary strategies to reduce loading. A Water Quality Improvement Grant will be used to implement these actions. Water quality impairments related to beryllium, manganese and low pH will be addressed by the TMDL implementation plan.

- EPA listed mercury contamination as an impairment for Alamo Lake during previous listing cycles. ADEQ is currently proposing to list one reach of the Santa Maria River for mercury. Fish consumption advisories have been issued at Alamo Lake and Coors Lake, which caution the public to limit the amount of fish they consume. Mercury may also pose a threat to bald eagles (a federally listed Threatened species) living near the lake, as they also eat the fish. Sampling and modeling for the Alamo Lake mercury TMDL to address to loadings from these tributaries has been completed, however approval of the final TMDL has been deferred in anticipation of a fish tissue water quality standard for methylmercury. Primary sources of the mercury appear to be atmospheric deposition and sediment transport during storm events.

- Alamo Lake and a segment of the Bill Williams below Alamo Lake are also impaired by ammonia and high pH. Ammonia and pH exceedances may be related to nutrient loadings. More monitoring is needed to determine if this is occurring at Alamo Lake and sources of nutrient loadings. A nutrient TMDL is scheduled to be initiated in 2010.

Water Quality Improvement Grant Projects – ADEQ awarded the following Water Quality Improvement Grants (319 Grants) in this watershed. More information concerning these grants or projects can be obtained at: http://www.azdeq.gov/environ/water/watershed/fin.html.

- **Cane Springs Ranch Catchment Restoration Project --** Cane Springs Ranch (2000)
  Repair and clean sediment catchments, to lessen sediment loading from Cane Springs Ranch to the Big Sandy River.

- **The Greater Kingman Wildcat Dump Cleanup Project –** NW AZ Watershed Council (2000)
  Clean up of 18 wildcat waste dump sites in the Kingman area; to reduce potential ground water contamination. Provide education and outreach to minimize further dumping.

Water Protection Fund Projects – The following Water Protection Fund Projects were awarded by the Arizona Department of Water Resources. More information about these funds or projects can be obtained from the ADWR web site at: http//www.azwater. gov.

- **Big Sandy River Riparian Project –** U.S. Bureau of Land Management (2000)
  Restore riparian condition along an 8-mile perennial reach of the Big Sandy River to reduce sediment transport. This included pasture fencing and development of alternative water sources for livestock.

- **Kirkland Creek Watershed Resource Assessment Project** – Triangle Natural Resources Conservation District (2000)
  Complete a resource assessment of Kirkland Creek and prepare a long-term action plan and implementation schedule for watershed enhancement activities.

Other Water Quality Studies – The following additional water quality related studies were completed since 2000 in this watershed.

- ***Bill Williams Watershed Plan and Characterization (2005)*** – Nonpoint Education for Municipal Officials (NEMO) Program, which is affiliated with the University of Arizona, in cooperation with ADEQ (2005)
  A watershed protection and remediation plan that identifies and quantitatively ranks subwatersheds that are most susceptible to water quality contaminants, specifically: metals, sediment, nutrients, and selenium. The plan also identifies management measures that should be implemented to improve water quality in high risk subwatersheds.

- ***Hydrologic Conditions in the Bill Williams River National Wildlife Refuge and Planet Valley, Arizona, 2000*** – Richard P. Wilson and Sandra J. Owen-Joyce, U.S. Geological Survey in cooperation with the U.S. Fish and Wildlife Service and the Bureau of Reclamation (2002)
  This was an investigation of the current hydrologic conditions along the Bill Williams River, and a delineation of the water table. It included an inventory of wells within the river aquifer of the Colorado River and in Planet Valley.

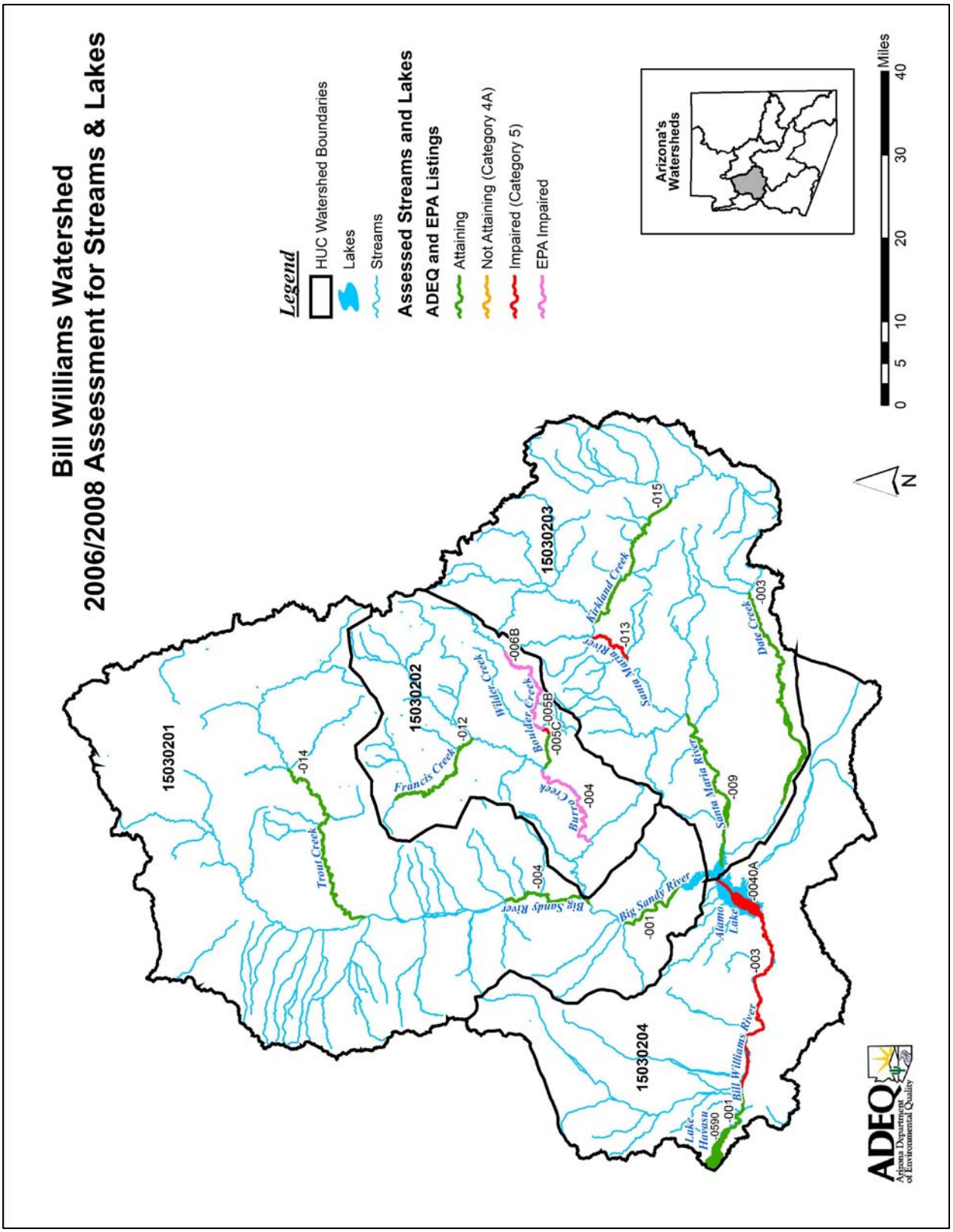
- ***Structural Controls on Ground Water Conditions and Estimated Aquifer Properties near Bill Williams Mountain, Williams, Arizona*** – Herbert A. Pierce, U.S. Geological Survey in cooperation with the City of Williams (2001)
  This is a description of the hydro-geologic units and ground water conditions in the regional aquifer near Williams, Arizona. It identifies regional geologic structural features that in part control ground water conditions, and presents estimated properties of the regional aquifer.

Assessments

The Bill Williams Watershed can be separated into the following drainage areas in Arizona:

15030201	Big Sandy River
15030202	Burro Creek
15030203	Santa Maria River
15030204	Bill Williams River

These drainage areas and the surface waters assessed as "attaining" or "impaired" are illustrated on the following watershed map. Methods used to complete these assessments are described in the "Surface Water Assessment Methods and Technical Support" document (2006/2008).


Bill Williams Watershed
2006/2008 Assessment for Streams & Lakes
Legend
HUC Watershed Boundaries
Lakes
Streams
Assessed Streams and Lakes
ADEQ and EPA Listings
Attaining
Not Attaining (Category 4A)
Impaired (Category 5)
EPA Impaired
Arizona's Watersheds
0 5 10 20 30 40
Miles
N
15030201
15030202
15030203
15030204
Trout Creek
Francis Creek
Wilder Creek
Boulder Creek
Burro Creek
Big Sandy River
Kirkland Creek
Santa Maria River
Date Creek
Alamo Lake
Lake Havasu
Bill Williams River
ADEQ
Arizona Department of Environmental Quality

ALAMO LAKE 15030204 – 0040A 14,150 Acres	USE SUPPORT		OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A D E Q	A&Ww – Impaired FBC – Impaired FC – Inconclusive AgL – Impaired	Category 5 Impaired	High pH, ammonia, and low dissolved oxygen	Add low dissolved oxygen to the 303(d) list. High pH listed in 1996. Ammonia listed in 2004.
	E P A	A&Ww – Impaired FC – Impaired	Category 5 Impaired	Mercury in fish tissue.	EPA listed mercury in 2002. Mercury TMDL is awaiting final EPA approval .

Light blue highlights indicate EPA impairments based on EPA assessment and listing criteria. This listing may change when EPA reviews and approves the 2006/2008 impaired waters list. Such listings do not satisfy requirements established in ADEQ's Impaired Water Identification Rule; therefore, they are not included in the list of ADEQ's impaired waters (Appendix B and Appendix C).

MONITORING USED IN THIS ASSESSMENT				
SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 01/10/2000 – 9/28/2004 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
At dam BWALA – A USFWS AL-1 101351	ADEQ and USFWS/CoE Ambient ADEQ TMDL	14-67 total and 8-15 dissolved metals: Antimony, arsenic, barium, beryllium, boron, cadmium, chromium, copper, lead, manganese, nickel, selenium, silver, thallium, and zinc 208 total and 21 dissolved: Mercury	122-173 samples: Ammonia, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen, dissolved oxygen, and pH	1 *E. coli* bacteria 14 Fluorine 40 Total dissolved solids 6 Suspended sediment concentration 6 Turbidity
Mid lake BWALA - B USFWS AL-2 101351	ADEQ and USFWS/CoE Ambient ADEQ TMDL			
Mid lake – North end BWALA – C USFWS AL-3 102514	ADEQ and USFWS/CoE Ambient ADEQ TMDL			
Above Alamo Lake, near Brown's crossing BWBWR045.08 102307	ADEQ TMDL			

EXCEEDANCES			
POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Ammonia	0.25 mg/L at pH 10.0 and temp 25.6 C 0.21 mg/L at pH 10.1 and temp 26.8 C A&Ww chronic	06/12/2000 – 0.6 mg/L 09/18/2000 – 0.3 mg/L	Remains impaired -- 2 exceedances during the assessment period.
Dissolved oxygen	6.0 mg/L (top meter) A&Ww	11/13/2000 – 5.5 mg/L 12/03/2001 – 3.3 mg/L 04/08/2002 – 1.5 mg/L 05/07/2002 – 1.8 mg/L 12/09/2002 – 4.4 mg/L 11/01/2003 – 1.9 mg/L 09/20/2004 – 4.0 mg/L 09/28/2004 – 4.9 mg/L 11/23/2004 – 5.5 mg/L	Impaired – Low dissolved oxygen in 9 of 60 sampling events (93 of 173 samples – binomial). (When multiple sites were sampled, the lowest DO is shown for that date.) (Binomial)

Mercury (dissolved)	0.01 µg/L A&Ww Chronic	09/28/2004 – 0.016 µg/L	Inconclusive – Only 1 exceedance in during the assessment period. (EPA listing of mercury is based on fish consumption advisory and not chemistry. See mercury discussion below.)
pH (high)	<9.0 SU A&Ww, FBC, AgL	01/10/2000 – 9.7 SU 04/17/2000 – 9.8 SU 06/12/2000 – 10.0 SU 09/08/2000 – 10.2 SU 04/09/2001 – 10.0 SU 06/17/2002 – 10.0SU 07/07/2002 – 10.3 SU 05/19/2003 – 10.1 SU 06/09/2003 – 10.2 SU 01/12/2004 – 9.7 SU	Remains impaired – High pH values in 10 of 60 sampling events (42 of 173 samples) (binomial).

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS			
EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	**MISSING CORE PARAMETERS**	**MISSING SEASONAL DISTRIBUTION**	**DETECTION LIMITS NOT LOW ENOUGH**
Mercury	Insufficient *E. coli* bacteria to assess FBC		Lab detection limit for dissolved mercury was higher than chronic criterion.
DISCUSSION OF MERCURY IMPAIRMENT		Evidence of potential mercury impairment: 1. The mercury fish consumption advisory issued in 2004 is still in effect; 2. Potential sources of mercury in the watershed; 3. Several tributaries in the watershed have exceedances of mercury standards; 4. Santa Maria River (a tributary to Alamo Lake) is proposed impaired due to mercury; and 5. The mercury TMDL for Alamo Lake should be completed in 2009. ADEQ cannot list Alamo Lake as impaired based on narrative toxic standards due to statutory constraints described in the Assessment Methods document.	
MONITORING RECOMMENDATIONS		High Priority – Collect dissolved oxygen, pH, and ammonia samples to support TMDL development. Low dissolved oxygen, high pH, and elevated ammonia may be symptoms of excess nutrient loadings. New methods for implementing the narrative nutrient standard should be applied to this lake once adopted, to determine whether narrative nutrient violations are occurring. Complete development of the mercury TMDL. Use a lower lab detection limit for dissolved mercury. Collect core parameters to represent at least 3 seasons during an assessment period.	

BIG SANDY RIVER From Sycamore Wash to Burro Creek 15030201 -- 004 13.8 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Inconclusive FBC – Inconclusive FC – Inconclusive AgL – Attaining	Category 2 Attaining some uses	

MONITORING USED IN THIS ASSESSMENT				
SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 02/15/2000 – 05/17/2005		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Highway 93 bridge BWBSR034.68 100400	ADEQ Ambient	8-23 total and 5-23 dissolved metals: Antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, nickel, silver, thallium, and zinc 31 total and 20 dissolved: Mercury 28 total metals only: Boron and manganese	22-28 samples: Ammonia, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen, dissolved oxygen, and pH	21 *E. coli* bacteria 23 Fluoride 22 Total dissolved solids 15 Suspended sediment concentration 25 Turbidity

EXCEEDANCES			
POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Copper (dissolved)	21.6 µg/L at 280 mg/L hardness A&Ww chronic	05/07/2001 – 26 µg/L	Inconclusive – Only 1 exceedance during the assessment period.
Dissolved oxygen	6.0 mg/L A&Ww	05/07/2001 – 4.9 mg/L 07/31/2003 – 5.0 mg/L 09/16/2003 – 5.3 mg/L 09/19/2004 – 5.5 mg/L# 09/28/2004 – 5.5 mg/L	Inconclusive – 4 out of 5 samples taken during low flow and lacked riffle morphology. #Low DO on 09/19/2004 was during storm flow (30,000 cfs as compared to normal of 1-6 cfs); therefore, only 4 of 26 samples did not meet the criterion. (Binomial)
E. coli bacteria	235 CFU/100 ml FBC	02/23/2005 – 620 CFU/100 ml	Inconclusive – Only 1 exceedance. Note that the exceedance occurred during flood flow – 1978 cfs, while normal is 1-6 cfs.
Lead	15 µg/L FBC	02/23/2005 – 27 µg/L	Attaining – Only 1 exceedance in 22 samples (Binomial)
Mercury	0.6 µg/L FC	10/04/2002 – 0.86 µg/L 1/23/2003 – 0.92 µg/L* 09/19/2004 – 2.7 µg/L	Inconclusive – Only 2 exceedances in 13 samples (Binomial) *Samples starting in 2003 superseded prior samples because more reliable methods were used to collect and analyze the data.
Suspended sediment concentration	Geometric mean 80 mg/L A&Ww	02/23/2004 – 227 mg/L 10/21/2004 – 9900 mg/L 12/29/2004 – 1735 mg/L 01/05/2005 – 1680 mg/L 02/23/2005 – 2360 mg/L	Inconclusive – 4 of the 5 samples that exceeded 80 mg/L occurred during high flows so could not be used in the geometric mean calculation. 227 mg/L was occurring during normal flow. Geometric mean standard was not exceeded. (Note that exceedances occurred during 4 of 5 consecutive months monitored.)

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS			
EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	**MISSING CORE PARAMETERS**	**MISSING SEASONAL DISTRIBUTION**	**DETECTION LIMITS NOT LOW ENOUGH**
E. coli bacteria, mercury, and suspended sediment.	**Collected all core parameters**		Lab detection limits for selenium and most of the dissolved mercury samples were higher than A&Ww chronic criteria.
MONITORING RECOMMENDATIONS		Medium Priority –Collect *E. coli* bacteria, mercury, and suspended sediment concentration samples due to exceedances. Use a lower lab detection limit for selenium and dissolved mercury The high suspended sediment concentration indicates heavy sediment transport. Recommend using biocriteria assessments and bottom deposits implementation procedures in this reach, when they are adopted.	

BIG SANDY RIVER From Rupley Wash to Alamo Lake 15030201 -- 001 10.2 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Inconclusive FBC – Attaining FC – Attaining AgL – Attaining	Category 2 Attaining some uses	

MONITORING USED IN THIS ASSESSMENT				
SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 10/02/2002 – 01/27/2004		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Near Wikieup, AZ BWBSR015.60 100457	ADEQ Ambient	4 total and dissolved metals: Antimony, arsenic, beryllium, cadmium, chromium, copper, zinc 4 total metals only: Boron, lead, manganese 6 total and 3 dissolved: Mercury	4-5 samples: Ammonia, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen, dissolved oxygen, and pH	4 *E. coli* bacteria 4 Fluoride 4 Total dissolved solids 4 Suspended sediment concentration 5 Turbidity

EXCEEDANCES			
POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Dissolved oxygen	6.0 mg/L A&Ww	10/02/2002 – 5.2 mg/L 12/04/2002 – 5.4 mg/L	Attaining – Low dissolved oxygen due to low flow and ground water upwelling.
Mercury (dissolved)	0.01 µg/L A&Ww chronic	02/24/2005 – 0.013 µg/L	Inconclusive – Criterion exceeded once during the assessment period.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS			
EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
Mercury	Collected all core parameters		Lab detection limits for selenium and half of the dissolved mercury samples were higher than A&Ww chronic criteria.
MONITORING RECOMMENDATIONS		Medium Priority –Monitor for mercury due to the exceedances. Use lower lab detection limits for selenium and dissolved mercury.	

BILL WILLIAMS RIVER From Alamo Lake to Castaneda Wash 15030204 -- 003 35.9 Miles	USE SUPPORT	OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A&Ww – Impaired FBC – Impaired FC – Attaining AgL – Impaired	Category 5 Impaired	Ammonia, low dissolved oxygen, and high pH	Add ammonia, low dissolved oxygen, and high pH to the 303(d) List.

MONITORING USED IN THIS ASSESSMENT				
SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 01/01/2000 – 11/20/2004 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Below Alamo Lake Dam BWBWR038.52 102316	USFWS Ambient and ADEQ TMDL	4-16 total metals only: Antimony, arsenic, beryllium, boron, cadmium, chromium, copper, manganese, mercury, nickel, selenium, silver, thallium, and zinc 1 total and 1 dissolved: Lead	36-56 samples: Ammonia, total nitrogen, total phosphorus, nitrite/nitrate, dissolved oxygen, and pH	5 Suspended sediment concentration 5 Turbidity

EXCEEDANCES			
POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Ammonia	0.39 mg/L at pH 9.4 and temp 18.6 C 0.46 mg/L at pH 9.2 and temp 15.5 C 0.39 mg/L at pH 9.3 and temp 17.9 C 0.49 mg/L at pH 8.8 and temp 18.5 C 0.43 mg/L at pH 9.0 and temp 16.3 C 0.47 mg/L at pH 9.0 and temp 15.7 C 0.53 mg/L at pH 9.0 and temp 15.7 C 0.31 mg/L at pH 9.0 and temp 21.8 C A&Ww chronic	06/12/2000 – 0.6 mg/L 10/15/2001 – 0.5 mg/L 07/21/2003 – 0.4 mg/L 08/18/2003 – 0.6 mg/L 09/08/2003 – 0.8 mg/L 06/07/2004 – 0.7 mg/L 07/07/2004 – 0.7 mg/L 09/20/2004 – 0.7 mg/L	Impaired –8 exceedances during the assessment period.
Dissolved oxygen	6.0 mg/L A&Ww	04/08/2002 – 2.7 mg/L 05/07/2002 – 1.7 mg/L 10/27/2002 – 3.6 mg/L 08/18/2003 – 4.8 mg/L 09/08/2003 – 5.0 mg/L 10/06/2003 – 5.5 mg/L 11/01/2003 – 4.0 mg/L 12/15/2003 – 5.0 mg/L 08/09/2004 – 4.7 mg/L 09/20/2004 – 0.7 mg/L	Impaired – Low dissolved oxygen in 10 of 55 samples (binomial).
Lead	15 mg/L FBC	10/27/2004 – 19.0 mg/L	Inconclusive – Only 1 exceedance in 2 sampling events
pH (high)	<9.0 SU A&Ww, FBC, AgL	04/17/2000 – 10.0 SU 06/12/2000 – 10.4 SU 09/18/2000 – 10.2 SU 04/09/2001 – 10.0 SU 05/07/2001 – 10.3 SU 10/15/2001 – 9.2 SU 06/17/2002 – 10.4 SU 07/07/2002 – 10.6 SU 07/21/2003 – 9.3 SU 01/12/2004 – 10.0 SU	Impaired – High pH values in 11 of 56 samples (binomial).

Suspended sediment concentration	Geometric mean 80 mg/L A&Ww	10/27/2004 – 448 mg/L 11/24/2004 – 193 mg/L	Inconclusive – Exceeded standards during both sampling events (3 of 5 samples). Insufficient samples to calculate the geometric mean (need a minimum of 4 samples).

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS			
EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	**MISSING CORE PARAMETERS**	**MISSING SEASONAL DISTRIBUTION**	**DETECTION LIMITS NOT LOW ENOUGH**
Suspended sediment and lead	Insufficient *E. coli* bacteria, dissolved metals (cadmium, copper, zinc) to assess FBC and A&Ww		
MONITORING RECOMMENDATIONS		High Priority – Collect dissolved oxygen, pH, and ammonia samples to support TMDL development. Coordinate TMDL developed for this reach with Alamo Lake, as all exceedances occurred just below the dam outlet from Alamo Lake. Collect suspended sediment concentration and lead samples due to exceedances. Recommend using biocriteria assessments and bottom deposits implementation procedures in this reach, when they are adopted.	

BILL WILLIAMS RIVER From point B to Colorado River 15030204 -- 001 17.5 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Attaining FBC – Attaining FC – Attaining AgL – Attaining	Category 1 Attaining all uses	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 01/25/2000 – 05/26/2004		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
At Mineral Wash near Planet BWBWR009.92 100924	USGS Ambient	3 total and 3-13 dissolved metals: Antimony, arsenic, beryllium, boron, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium, silver, and zinc 2 total and 13 dissolved: Barium, chromium, nickel, and silver 3 total only: Mercury	3-13 samples: Ammonia, total nitrogen, total phosphorus, nitrite/nitrate, dissolved oxygen, and pH	8 *E. coli* bacteria 12 Fluorine 6 Suspended sediment concentration 4 Turbidity

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Dissolved oxygen	6.0 mg/L A&Ww	05/15/2002 – 5.3 mg/L 08/26/2003 – 2.2 mg/L	Attaining – Low dissolved oxygen due to natural conditions of low flow and ground water recharge.
Suspended sediment concentration	Geometric mean 80 mg/L A&Ww	01/30/2003 – 95 mg/L 05/28/2003 – 83 mg/L 05/26/2004 – 121 mg/L	Attaining – Although 3 samples exceeded the 80 mg/L criterion, a rolling geometric mean of 4 consecutive samples did not exceed the standard.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Collected all core parameters		
MONITORING RECOMMENDATIONS		Low Priority – Since the 80 mg/L criterion for suspended sediment was exceeded during low flows, recommend using biocriteria assessments and bottom deposits implementation procedures in this reach, when they are adopted.	

BOULDER CREEK From unnamed tributary at 344114 / 1131800 to Wilder Creek 15030202 – 006B 14.4 Miles	USE SUPPORT		OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A D E Q	A&Ww – Inconclusive FBC – Inconclusive FC – Attaining AgL – Attaining	Category 2 Attaining Some Uses		
	E P A	A&Ww – Impaired	Category 5 Impaired	Mercury	EPA listed mercury in 2004. (See mercury discussion below)

Light blue highlights indicate EPA impairments based on EPA assessment and listing criteria. This listing may change when EPA reviews and approves the 2006/2008 impaired waters list. Such listings do not satisfy requirements established in ADEQ's Impaired Water Identification Rule; therefore, they are not included in the list of ADEQ's impaired waters (Appendix B and Appendix C).

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 02/10/2000 – 08/04/2005 4-day mercury samples: 06/20- 06/23/2005; 08/01-08/04/2005; 10/24-10/27/2005; 2/6-2/9/2006; 5/1-5/4/2006 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
At Wild Horse Basin BWBOU017.35 102022	ADEQ TMDL	16 total and 36 dissolved: Mercury (grab samples) Five 4-day mercury sampling events 9-23 total and 9-14dissolved metals: Arsenic, beryllium, chromium, copper, lead, manganese, and zinc 14 total metals only: Cadmium, selenium, silver	7 Dissolved oxygen and 50 pH	3 Suspended sediment concentration 2 Turbidity
Below Warm Spring Creek Tungstona 1 BWBOU013.05 102019	Phelps Dodge Ambient			
Below Tungstona Mine Tungstona 2 BWBOU012.82 102233	Phelps Dodge Ambient			
Uppermost project site Site N BWBOU009.00 101015	ADEQ TMDL			
Above Hillside Mine Hillside 2 BWBOU008.92 100401	Phelps Dodge Ambient			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Beryllium	65 µg/L A&Ww acute	08/16/2001 – 94 µg/L	Inconclusive – 1 exceedance in the last 3 year of monitoring.
Mercury	0.6 µg/L FC	09/10/2002 – 3.4 µg/L	Attaining – 1 exceedance in 8 sampling events. (Binomial)
Mercury (dissolved)	0.01 µg/L A&Ww chronic	08/23/2000 – 0.3 µg/L 03/05/2002 – 0.3 µg/L 04/18/2002 – 0.2 µg/L 09/10/2002 – 2.7 µg/L** 11/20/2002 – 0.2 µg/L 02/23/2004 – 0.018 µg/L*	Inconclusive –Only 1 exceedance is counted. *Samples starting in 2003 superseded prior samples because more reliable methods were used to collect and analyze the data. **2.7 is the mean of three mercury samples collected on 09/10/2002 (1.8, 2.9, and 3.4) µg/L). See mercury discussion below.

Suspended sediment concentration (SSC)	Geometric mean 80 mg/L A&Ww	09/19/2004 – 4554 mg/L 10/22/2004 – 432 mg/L	Inconclusive – Both exceedances occurred during high flows, so could not be used for geometric mean calculation. Insufficient samples left to apply the standard.

DATA GAPS AND MONITORING NEEDS			
EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	**MISSING CORE PARAMETERS**	**MISSING SEASONAL DISTRIBUTION**	**DETECTION LIMITS NOT LOW ENOUGH**
Beryllium, mercury, and suspended sediment concentration	Insufficient *E. coli* bacteria to assess FBC		Lab detection limits for dissolved copper and lead were above A&W chronic criteria in at least 6 samples.
MERCURY IMPAIRMENT DISCUSSION		Ultra clean field techniques were used for mercury samples collected in 2003-2006 by ADEQ and Phelps Dodge. These techniques allow laboratories to accurately report results as low as 0.00025 µg/L. This newer and more reliable data was therefore given a higher weight in the assessment, and in this case superseded previously collected data. Five sets of 4-day mercury samples collected by Phelps Dodge were considered in this assessment although several sets were collected after the assessment period (newer data). No exceedances occurred in these datasets. The exceedance on 02/23/2004 (0.018 µg/L) occurred at Wild Horse Basin and an old mining operation exists in this area. Samples collected during storm flows did not represent chronic conditions, so were not compared to chronic criteria for this assessment. Evidence of potential mercury impairment: 1. Several mercury detections in this reach. Mercury readily adheres to sediment and tissue, and therefore, the detection of it in the water column is unlikely and therefore significant. 2. Mercury fish consumption advisory downstream at Alamo Lake; 3. One exceedance of the total mercury standard for fish consumption; and 4. Historic mining sources in the reach. Although there is evidence of impairment, only one exceedance using the more reliable field and laboratory methods is insufficient for Arizona to list the reach as impaired. Note that the Alamo Lake mercury TMDL should be completed in 2009 and may provide loadings to the Burro Creek drainage area (that includes Boulder Creek).	
MONITORING RECOMMENDATIONS		Medium Priority – Collect mercury, beryllium, and suspended sediment concentration samples due to the exceedances. Collect core parameters to represent at least 3 seasons during an assessment period. Use lower lab detection limits for dissolved copper and lead.	

BOULDER CREEK From Wilder Creek to Butte Creek 15030202 – 005A 1.4 Miles (Since last assessment, split reach 005A into 005A&B, and changed 005B to 005C)	USE SUPPORT	OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A&Ww – Impaired FBC – Impaired FC – Inconclusive AgI -- Impaired AgL – Impaired	Category 4A (arsenic, copper, zinc) Category 4B (beryllium, low pH, manganese) Not Attaining	Beryllium, low pH, manganese, arsenic, copper, and zinc	Add beryllium, manganese, and low pH to 4B. TMDLs for arsenic, copper, and zinc were completed in 2004.
	A&Ww – Impaired (Affected use only)	Category 5 Mercury	Mercury	EPA listed mercury in 2004.

Light blue highlights indicate EPA impairments based on EPA assessment and listing criteria. This listing may change when EPA reviews and approves the 2006/2008 impaired waters list. Such listings do not satisfy requirements established in ADEQ's Impaired Water Identification Rule; therefore, they are not included in the list of ADEQ's impaired waters (Appendix B and Appendix C).

MONITORING USED IN THIS ASSESSMENT				
SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 02/10/2000 – 08/04/2005 4-day mercury samples: 11/29-12/02/2004; 06/20-06/23/2005; 08/01-08/04/2005; 10/24-10/27/2005; 2/6-2/9/2006; 5/1-5/4/2006 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Below Wilder Creek – Site L BWBOU008.62 101013	ADEQ TMDL	17 total and 29 dissolved: Mercury (grab samples) Six sets of 4-day mercury samples 50-66 total and dissolved metals: Arsenic, beryllium, copper, lead, manganese, and zinc 17 total and 4-22 dissolved: Cadmium 13-16 total and 2-3 dissolved: Selenium, silver 2 total and 3 dissolved: Antimony, barium, boron, nickel	57 Dissolved oxygen and 107 pH	2 Fluoride 10 Suspended sediment concentration 4 Turbidity
Hillside Mine upper tailings BWBOU008.53 102232	ADEQ TMDL			
NW edge upper tailings BWBOU008.49 102231	ADEQ TMDL			
Above Hillside Mine BWBOU008.42 102023	ADEQ TMDL			
Upstream of tailings Site JJ BWBOU008.28 101439	ADEQ TMDL			
Above Hillside middle tailings BWBOU007.98 102226	ADEQ TMDL			
Amid tailings (mid + up) Site J BWBOU007.92 101012	ADEQ TMDL			
At Hillside adit BWBOU007.83 102024	ADEQ TMDL			
Amid tailings (mid + low)Site-H BWBOU007.76 101011	ADEQ TMDL			
Below middle tailings piles BWBOU007.59 102227	ADEQ TMDL			
Between mid and lower tailings BWBOU007.55 102228	ADEQ TMDL			
Above lower tailings pile BWBOU007.49 102229	ADEQ TMDL			
Near lower tailings pile BWBOU007.43 102230	ADEQ TMDL			

Below tailings piles - Site G BWBOU007.13 101010	ADEQ TMDL			
Above Butte Creek Hillside 1 BWBOU006.57 102223	Phelps Dodge Ambient			

EXCEEDANCES			
POLLUTANT	**STANDARD UNIT DESIGNATED USES**	**DATES EXCEEDANCES**	**DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS**
Arsenic	50 µg/L – FBC 200 µg/L – AgL 1450 µg/L – FC 2000 µg/L – AgI	Too many exceedances to list here.	Remains impaired – Exceedances occurred during all 23 sampling events (Binomial) Maximum concentration was 11,400 µg/L. Highest values were at site 102024. Exceedances occurred at several other sites.
Beryllium	5.3 µg/L A&Ww chronic	10/26/2000 – 63 µg/L 03/27/2001 – 6.0 µg/L 04/25/2001 – 6.0 µg/L 05/22/2001 – 6.0 µg/L 08/15/2001 – 31 µg/L 08/28/2001 – 19 µg/L 11/02/2001 – 5.5 µg/L	Impaired – Exceeded criterion during 7 sampling events during the assessment period. (Exceeded in 10 of 66 samples collected.) See monitoring site discussion below.
Copper	500 µg/L – AgL 1300 µg/L – FBC 5000 µg/L – AgI	10/26/2000 – 36,000 µg/L 08/15/2001 – 36,000 µg/L 08/28/2001 – 115,000 µg/L	Attaining – Exceeded standards in 6 of 73 samples (only 3 monitoring events). (Binomial)
Copper (dissolved)	49.6 µg/L at >400 mg/L hardness 9.8 µg/L at 72 mg/L hardness 49.6 µg/L at >400 mg/L hardness 49.6 µg/L at >400 mg/L hardness 30.7 µg/L at 240 mg/L hardness A&Ww acute	10/26/2000 – 39,000 µg/L 01/30/2001 – 80 µg/L 08/15/2001 – 33,100 µg/L 08/28/2001 – 114,000 µg/L 12/31/2001 – 90 µg/L	Remains impaired – Exceeded calculated standard five times during the assessment period.
Dissolved oxygen	6.0 mg/L A&Ww	Too many to list here. Low dissolved oxygen values in 11 of 15 sampling events.	Attaining – Low dissolved oxygen due to low flow and ground water upwelling.
Lead	15 µg/L FBC	01/30/2001 – 30 µg/L 02/27/2001 – 17 µg/L 08/15/2001 – 24 µg/L	Attaining – 3 of 62 samples exceeded criterion.
Manganese	10,000 µg/L -- AgI 196,000 µg/L – FBC	Too many exceedances to list here.	Impaired – 22 of 74 samples exceeded standards. (14 of 20 sampling events). (Binomial) Highest value was 367,000 µg/L. High concentrations were found at several sites. See monitoring site discussion below.
Mercury	0.6 µg/L – FC 10 µg/L – AgL	09/10/2002 – 3.8 µg/L** 08/23/2003 – 98 µg/L*	Attaining – 1 exceedance in 11 sampling events. (binomial approach) ** Data collected before more reliable sampling techniques. *98 µg/L is the mean value of 3 samples collected below the tailings.
Mercury (dissolved)	0.01 µg/L A&Ww chronic	03/21/2001 – 0.2 µg/L 9/10/2002 – 3.8 µg/L 09/25/2003 – 0.0365 µg/L*	Inconclusive – Only 1 exceedance is counted (09/25/2003). *Samples starting in 2003 superseded prior samples because more reliable methods were used to collect and analyze the data. See mercury discussion below.
pH	<9.0 SU -- A&Ww, FBC, AgL, AgI >6.5 SU – A&Ww, FBC, AgL	08/22/2000 – 9.5 SU 10/26/2000 – 2.6 SU 01/30/2001 – 6.2 SU 03/27/2001 – 5.6 SU 04/25/2001 – 6.0 SU 05/22/2001 – 6.0 SU 06/26/2001 – 5.7 SU 08/15/2001 – 3.7 SU 08/28/2001 – 11.7 SU 08/28/2001 – 2.4 SU 11/02/2001 – 5.9 SU	Impaired – Exceeded criteria in 25 of 87 samples (12 of 30 sampling events). (Binomial) See monitoring site discussion below.

		09/25/2003 – 1.9 SU	
Suspended sediment concentration (SSC)	Geometric mean 80 mg/L	08/23/2003 – 48,627 mg/L 09/19/2004 – 1,443 mg/L 10/21/2004 – 1,747 mg/L	Attaining– All exceedances of the 80 mg/L criterion were during high flow events so could not be included in the geometric mean. Geometric mean was not exceeded.
Zinc	10,000 – AgI 25,000 – AgL 69,000 – FC	10/26/2000 – 160,000 µg/L 08/15/2001 – 184,000 µg/L 08/28/2001 – 692,000 µg/L	Attaining – 8 of 66 samples exceeded (3 of 24 sampling events). (Binomial) However, magnitude of the exceedances should be noted.
Zinc (dissolved)	379 µg/L at >400 mg/L hardness 379 µg/L at >400 mg/L hardness 379 µg/L at >400 mg/L hardness A&Ww acute	Too many to list here	Remains impaired – Exceeded criteria 13 times during the last 3 years of monitoring. Highest concentration was 262,000 µg/L. Exceedances occurred during all 17 sampling events.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
Mercury	*E. coli* bacteria		Lab detection limits for dissolved metals (copper, lead) and selenium were higher than chronic criteria in 6-35 samples.

DISCUSSION OF ASSESSMENT CATEGORIES, REMEDIATION EFFORTS, AND USE OF MONITORING DATA FROM POOLS ALONG THIS INTERMITTENT STREAM

Arsenic, copper, and zinc are in Category 4A because TMDLs have been completed for these parameters. Proposed remediation of historic mine tailings along Boulder Creek should mitigate the metal loadings (including mercury loadings) and the low pH; therefore, beryllium, manganese, and low pH are listed Category 4B.

Ultra clean field techniques were used for mercury samples collected in 2003-2006 by ADEQ and Phelps Dodge. These techniques allow laboratories to accurately report results as low as 0.00025 µg/L. This newer and more reliable data was therefore given a higher weight in the assessment, and in this case superseded previously collected data.

Six sets of 4-day mercury samples collected by Phelps Dodge were considered in this assessment although several sets were collected after the assessment period (newer data). No exceedances occurred in these datasets. However, one exceedance occurred near Hillside Mine's upper tailings site on 09/25/2003 (0.0365 µg/L).

Samples collected during storm flows did not represent chronic conditions, so were not compared to chronic criteria for this assessment.

Evidence of potential mercury impairment:

1. Several mercury detections in this reach. Mercury readily adheres to sediment and tissue, and therefore, the detection of it in the water column is unlikely and therefore significant.
2. Mercury fish consumption advisory downstream at Alamo Lake;
3. One exceedance of the total mercury standard for fish consumption; and
4. Historic mining sources in the reach.

Although there is significant evidence of impairment, only one exceedance using the more reliable field and laboratory methods is insufficient for Arizona to list the reach as impaired.

Note that the Alamo Lake mercury TMDL should be completed in 2009 and may provide loadings to the Burro Creek drainage area (that includes Boulder Creek).

MONITORING RECOMMENDATIONS

Medium Priority –Collect mercury samples due to exceedances. Collect arsenic, beryllium, copper, manganese, mercury, zinc, and pH samples during critical conditions and in critical locations, once strategies are implemented to reduce loadings. Collect core parameters to represent at least 3 seasons during an assessment period. Use lower lab reporting limits for selenium and dissolved metals.

BOULDER CREEK From Butte Creek to Copper Creek 15030202 – 005B 1.6 Miles (Since last assessment, split reach 005A into 005A&B, and changed 005B to 005C)	USE SUPPORT	OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A&Ww – Inconclusive FBC – Impaired FC – Inconclusive AgL – Attaining	Category 4A Not Attaining	Arsenic	TMDL for arsenic, copper, and zinc completed in 2004.

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 02/10/2000 – 08/04/2005 4-day mercury samples: 11/29-12/02/2004 ; 06/20-06/23/2005; 08/01-08/04/2005; 10/24-10/27/2005; 2/6-2/9/2006; 5/1-5/4/2006 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Below Butte Creek BWBOU006.53 102082	ADEQ TMDL	6 total and 14 dissolved (grab samples): Mercury 3 sets of 4-day mercury samples were collected at Boulder 2 site 6 total and 11-12 dissolved metals: Arsenic, copper, manganese, and zinc 5-6 total only: Beryllium, lead, 1-2 total and dissolved: Cadmium, selenium, silver	5 Dissolved oxygen and 20 pH	
Below Butte Creek – Site E BWBOU006.01 101009	ADEQ TMDL			
Above Copper Creek Boulder 2 BWBOU005.15 102193	Phelps Dodge Ambient			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Arsenic	50 µg/L – FBC	11/30/2000 – 58 µg/L 01/04/2001 – 71 µg/L 04/24/2001 – 73 µg/L 03/05/2002 – 53 µg/L	Remains impaired – Exceedances occurred in 4 of 12 sampling events (4 of 16 samples) (Binomial)

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Insufficient *E. coli* bacteria, dissolved cadmium, and mercury to assess A&Ww, FBC or FC		Lab detection limits for dissolved metals (copper, lead) and selenium were higher than chronic criteria.
MONITORING RECOMMENDATIONS		Medium Priority –Collect arsenic samples to determine effectiveness of strategies to reduce loading, once implemented. Collect core parameters to represent at least 3 seasons during an assessment period. Use lower lab detection limits for selenium and dissolved metals. Note: No mercury exceedances.	

BOULDER CREEK From Copper Creek to Burro Creek 15030202 – 005C 5.0 Miles	USE SUPPORT	OVERALL ASSESSMENT	(Since last assessment, split reach 005A into 005A&B, and changed 005B to 005C)
	A&Ww – Inconclusive FBC – Inconclusive FC – Attaining AgL – Attaining	Category 2 Attaining some uses	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 02/10/2000 – 08/04/2005 4-day mercury samples: 11/29-12/02/2004; 06/20-06/23/2005; 08/01-08/04/2005; 10/24-10/27/2005; 2/6-2/9/2006; 5/1-5/4/2006 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Below Copper Creek Boulder 1 or Site B BWBOU005.11 101008	Phelps Dodge Ambient and ADEQ TMDL	12 total and 27 dissolved: Mercury (grab samples) Six 4-day mercury samples 9-26 total and dissolved metals: Arsenic, beryllium, chromium, copper, lead, manganese, and zinc 12 total only: Cadmium, selenium	13 Dissolved oxygen and 41 pH	1 Suspended sediment concentration 5 Turbidity
Below Mulholland Wash Boulder 4 BWBOU002.18 102224	Phelps Dodge Ambient			
Above Zana Canyon BWBOU001.51 102225	ADEQ TMDL			
Above Burro Creek – Site A BWBOU000.66 101007	ADEQ Ambient			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Arsenic	50 µg/L FBC	01/04/2001 – 52 µg/L 04/24/2001 – 58 µg/L	Attaining – 2 of 17 samples exceeded the criterion (binomial).
Dissolved oxygen	6.0 mg/L A&Ww	05/23/2001 – 3.9 mg/L	Attaining – Low dissolved oxygen due to low flow and ground water upwelling.
Lead	15 µg/L FBC	02/28/2001 – 34 µg/L	Attaining – Only 1 exceedance in 14 samples.
Mercury	0.6 µg/L FC	09/10/2002 – 7.2 µg/L*	Attaining – *No exceedances in 8 sampling events using more reliable sampling techniques. (binomial).
Mercury (dissolved)	0.01 µg/L A&Ww chronic	09/10/2002 – 7.2 µg/L*	Attaining – *No exceedances in 8 sampling events using more reliable sampling techniques.
pH	<9.0 SU A&Ww, FBC, AgL	08/23/2000 – 9.4 SU	Attaining – Only 1 exceedance in 41 samples (binomial)
Selenium	2.0 µg/L A&Ww chronic	03/04/2002 – 3.0 µg/L	Inconclusive– One exceedance during the assessment period. Exceedance in the prior year is only slightly over the standard.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
Selenium	Insufficient *E. coli* bacteria to assess FBC.		
MONITORING RECOMMENDATIONS		Medium Priority –Collect additional selenium samples due to the exceedance. Collect core parameters to represent at least 3 seasons during an assessment period.	

BRIDLE CREEK From headwaters to Santa Maria River 15030203 – 027 25.8 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Inconclusive FBC – Inconclusive FC – Inconclusive	Category 3 Inconclusive	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 09/09/2003 – 01/05/2005		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Above Highway 97 BWBRI016.91 102310	ADEQ TMDL	6 total metal and 4 dissolved: Mercury	1 Dissolved oxygen, 6 pH	1 Fluoride 5 Suspended sediment concentration 3 Turbidity
Below Mountain Springs BWBRI009.54 102313	ADEQ TMDL			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Mercury	0.6 µg/L FC	09/09/2003 – 0.63 µg/L	Inconclusive – Only 1 exceedance in 6 samples (binomial).
Suspended Sediment Concentration (SSC)	Geometric mean 80 mg/L A&Ww	08/17/2004 – 4440 mg/L 09/19/2004 – 1026 mg/L 10/21/2004 – 530 mg/L 01/06/2005 – 8616 mg/L	Inconclusive – Exceedances occurred during all 4 sampling events; however, samples were collected during higher flows, so could not be included in the Geometric mean calculation. Geometric mean was not exceeded.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
Mercury and suspended sediment	Insufficient dissolved metals (cadmium, copper, zinc), *E. coli* bacteria, total copper and total lead to assess A&Ww, FBC, and FC	Insufficient monitoring events	
MONITORING RECOMMENDATIONS		Medium Priority –Collect mercury and suspended sediment samples due to exceedances. Collect core parameters to represent at least 3 seasons during an assessment period. The high SSC values indicate heavy sediment transport. Recommend using biocriteria assessments and bottom deposits implementation procedures in this reach, when they are adopted.	

BURRO CREEK From Francis Creek to Boulder Creek 15030202 – 008 13.8 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Inconclusive FBC – Inconclusive FC – Inconclusive AgL – Inconclusive	Category 3 Inconclusive	

MONITORING USED IN THIS ASSESSMENT				
SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 02/10/2000 – 08/04/2005 4-day mercury samples: 06/20-06/23/2005; 08/01-08/04/2005; 10/24-10/27/2005; 2/6-2/9/2006; 5/1-5/4/2006		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Above Boulder Creek Burro 3 BWBRO029.91 100404	Phelps Dodge Ambient and ADEQ TMDL	5 total and 15 dissolved metals: Chromium, mercury Five sets of 4-day mercury samples 5-6 total only: Arsenic, cadmium, copper, manganese, selenium, silver, and zinc. 1 total only: Beryllium	1 Dissolved oxygen and 17 pH	1 Suspended sediment concentration 1 Turbidity

EXCEEDANCES			
POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Chromium	100 µg/L FBC	09/09/2002 – 150 µg/L	Inconclusive – 1 of 6 samples exceeded the criterion (binomial).

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS			
EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
Chromium	Insufficient dissolved metals (cadmium, copper, zinc), *E. coli* bacteria, boron and lead to assess designated uses		
MONITORING RECOMMENDATIONS		Medium Priority – Collect chromium samples due to the exceedances. Collect core parameters to represent at least 3 seasons during an assessment period. Note: No dissolved mercury exceedances since "clean hands" field and laboratory techniques were applied. This includes the last 3 years of monitoring.	

BURRO CREEK From Boulder Creek to Black Canyon Creek 15030202 – 004 17.2 Miles	USE SUPPORT		OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A D E Q	A&Ww – Attaining FBC – Inconclusive FC – Attaining AgL – Attaining	Category 2 Attaining some uses		
	E P A	A&Ww – Impaired	Category 5 Impaired	Mercury	EPA listed mercury in 2004.

Light blue highlights indicate EPA impairments based on EPA assessment and listing criteria. This listing may change when EPA reviews and approves the 2006/2008 impaired waters list. Such listings do not satisfy requirements established in ADEQ's Impaired Water Identification Rule; therefore, they are not included in the list of ADEQ's impaired waters (Appendix B and Appendix C).

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 02/10/2000 – 08/04/2005 4-day mercury samples: 11/29-12/02/2004 ; 06/20-06/23/2005; 08/01-08/04/2005; 10/24-10/27/2005; 2/6-2/9/2006; 5/1-5/4/2006 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Below Boulder Creek BWBRO029.27 100403	ADEQ Ambient	43 total and 51 dissolved: Mercury (grab samples) Six sets of 4-day mercury samples 13-33 total and dissolved metals: Antimony, arsenic, beryllium, cadmium, chromium, copper, lead, and zinc 11-30 total metals only: Boron, manganese, selenium 5-6 total and dissolved metals: Barium, nickel, thallium, silver	19-30 Ammonia, total nitrogen, total phosphorus, nitrite/nitrate, dissolved oxygen 60 pH	18 *E. coli* bacteria 20 Fluoride 20 Total dissolved solids 21 Suspended sediment concentration 26 Turbidity
Below Mammoth Wash Burro 4 BWBRO025.09 102243	Phelps Dodge Permit Ambient			
Above Six-mile Crossing Burro 2 BWBRO023.54 102244	Phelps Dodge Permit Ambient			
Below Six-mile Crossing BWBRO023.18 101365	ADEQ Ambient			
At old Highway 93 bridge BWBRO012.95 102025	ADEQ TMDL			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Mercury	0.6 µg/L FC	11/18/2002 – 0.8 µg/L 09/19/2004 – 1.4 µg/L*	Attaining – *Only 1 exceedance in 18 sampling events (using more reliable monitoring techniques). (Binomial)
Mercury (dissolved)	0.01 µg/L A&Ww chronic	02/10/2000 – 0.2 µg/L** 03/04/2002 – 0.5 µg/L** 11/18/2002 – 0.8 µg/L** 02/10/2003 – 0.2 µg/L**	Attaining – **No exceedances based on newer, more reliable data. Sample results starting in June 2003 superseded prior samples because more reliable methods were used to collect and analyze the samples. (See mercury discussion below.)
Suspended sediment concentration (SSC)	Geometric mean 80 mg/L	09/19/2004 – 3110 mg/L 10/22/2004 – 2385 mg/L 11/23/2004 – 83 mg/L 12/29/2004 – 1067 mg/L	Attaining – Although 4 samples exceeded the 80 mg/L criterion, all occurred during high flow events, so these measurements could not be included in the geometric mean calculation. Remaining samples did not exceed the geometric mean standard.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS			
EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	**MISSING CORE PARAMETERS**	**MISSING SEASONAL DISTRIBUTION**	**DETECTION LIMITS NOT LOW ENOUGH**
	E. coli bacteria		
MERCURY DISCUSSION		Ultra clean field techniques were used for mercury samples collected in 2003-2006 by ADEQ and Phelps Dodge. These techniques allow laboratories to accurately report results as low as 0.00025 µg/L. This newer and more reliable data was therefore given a higher weight in the assessment, and in this case superseded previously collected data. Six sets of 4-day mercury samples collected by Phelps Dodge were considered in this assessment although several sets were collected after the assessment period (newer data). No exceedances occurred in these datasets. Evidence of potential mercury impairment: 1. Historic mining sources in tributaries; 2. Mercury fish consumption advisory downstream at Alamo Lake; 3. The one exceedance of the fish consumption standard occurred during a flood flow when dissolved mercury could not be calculated by the laboratory; 4. The Alamo Lake mercury TMDL should be completed in 2007 and may provide sufficient loading analysis; and 5. No exceedances occurred in any of the samples where the more reliable monitoring and analysis techniques were used. Although some evidence of potential impairment exists, no exceedances occurred during the assessment period when more reliable monitoring techniques were used.	
MONITORING RECOMMENDATIONS		Low Priority – Collect mercury data to evaluate effectiveness of the mine tailings remediation actions. Collect missing core parameters to represent at least 3 seasons during an assessment period. The high SSC values indicate heavy sediment transport. Recommend using biocriteria assessments and bottom deposits implementation procedures in this reach, when they are adopted.	

BUTTE CREEK From headwaters to Burro Creek 15030202 -- 163 2.8 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Inconclusive FBC – Inconclusive FC – Inconclusive	Category 3 Inconclusive	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 02/10/2000 – 07/13/2005 4-day mercury samples: 11/29-12/02/2004 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Hillside Mine area tributary BWBUT000.59 103504	Phelps Dodge Ambient	5 total and 5-6 dissolved: Chromium 9 total and 10 dissolved: Mercury (grab samples) Four sets of 4-day mercury samples 4-8 total and 0-1 dissolved metals: Arsenic, beryllium, cadmium copper, lead, manganese, selenium, silver, zinc.	1 sample: Dissolved oxygen 12 pH	3 Turbidity
Above Boulder Creek BWBUT000.02 102081	ADEQ TMDL			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Mercury	0.6 µg/L FC	03/05/2002 – 1.1 µg/L*	Attaining – *No exceedances in 3 sampling events collected using more reliable monitoring and lab techniques.
Mercury (dissolved)	0.01 µg/L A&Ww chronic	03/21/2001 – 0.2 µg/L* 03/05/2002 – 1.1 µg/L*	Attaining – *No exceedances in 3 sampling events. Newer, more reliable monitoring and lab analysis data supersedes the previously collected data.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
Mercury	Insufficient dissolved metals (cadmium, copper, and zinc), and *E. coli* bacteria to assess A&Ww and FBC.		
MONITORING RECOMMENDATIONS		Low Priority -- Collect core parameters to represent at least 3 seasons during an assessment period.	

COORS LAKE 15030202 -- 5000 230 Acres	USE SUPPORT		OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A D E Q	A&Ww – Inconclusive FBC – Inconclusive FC – Inconclusive	Category 3 Inconclusive		
	E P A	FC – Impaired	Category 5 Impaired	Mercury	EPA assessed as impaired in 2004 due to mercury in fish tissue

Light blue highlights indicate EPA impairments based on EPA assessment and listing criteria. This listing may change when EPA reviews and approves the 2006/2008 impaired waters list. Such listings do not satisfy requirements established in ADEQ's Impaired Water Identification Rule; therefore, they are not included in the list of ADEQ's impaired waters (Appendix B and Appendix C).

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 02/10/2000 – 07/13/2005 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Mid lake BWCOO - B 102756	AGFD Ambient	1 total metal only: Cadmium, lead, nickel, and zinc.	1 sample: Dissolved oxygen, pH, ammonia, nitrite/nitrate, nitrogen, total Kjeldahl nitrogen, and phosphate	1 Fluoride

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances in water chemistry			

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Insufficient core parameters	Insufficient monitoring events	Lab detection limit for total mercury was higher than FC criterion.
MERCURY IMPAIRMENT DISCUSSION		Evidence of potential mercury impairment: • A fish consumption advisory issued in 2004 is still in effect.	
MONITORING RECOMMENDATIONS		High Priority –Collect mercury samples to support development of a TMDL, Collect core parameters to represent at least 3 seasons during an assessment period. Use a lower lab detection limit for mercury.	

COPPER BASIN WASH From headwaters to unnamed tributary at 342811 / 1123531 15030203 – 032A 4.6 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Wc – Inconclusive FBC – Inconclusive FC – Inconclusive AgL – Inconclusive	Category 3 Inconclusive	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING DATE: 03/03/2004 NUMBER AND TYPES OF SAMPLES Metals	Nutrients – Related	Other
Upper Copper Basin Wash BWCBW009.23 102323	ADEQ TDML	1 total and 1 dissolved: Mercury 1 total metals only: Antimony, arsenic, barium, beryllium, boron, cadmium, chromium, copper, lead, manganese, nickel, selenium, silver, and zinc	None	None

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Copper	500 µg/L – AgL 1300 µg/L – FBC	03/03/2004 – 1720 µg/L	Inconclusive – Only 1 exceedance (binomial)
Lead	15 µg/L FBC	03/03/2004 – 20 µg/L	Inconclusive – Only 1 exceedance (binomial)
Selenium	2.0 µg/L A&Wc chronic	03/03/2004 – 5.0 µg/L	Inconclusive – Only 1 exceedance in the assessment period.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
Copper, lead and selenium	Insufficient core parameters	Insufficient sampling events.	
MONITORING RECOMMENDATIONS		Medium Priority –Collect copper, lead, and selenium samples due to exceedances. Collect core parameters to represent at least 3 seasons during an assessment period. (Note that A&W chronic criteria for mercury do not apply to this ephemeral wash.)	

DATE CREEK From Cottonwood Creek to unnamed reach (15030203-008) 15030203 -- 003 34.1 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Attaining FBC – Attaining FC – Attaining AgL – Attaining	Category 1 Attaining all uses	

MONITORING USED IN THIS ASSESSMENT				
SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 10/22/2002 – 05/26/04		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Above Date Creek Ranch BWDAT038.02 100529	ADEQ Ambient and TMDL	4-5 total and dissolved metals: Antimony, arsenic, beryllium, cadmium, chromium, copper, zinc 4 total and 0 dissolved: Boron, lead, manganese 6 total and 2 dissolved: mercury 1 total and 0-1 dissolved: Barium, nickel, selenium, silver	4-5 samples: Ammonia, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen, dissolved oxygen, and pH	3 *E. coli* bacteria 5 Fluoride 4 Total dissolved solids 4 Suspended sediment concentration 5 Turbidity

EXCEEDANCES			
POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS			
EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Collected all core parameters		Lab detection limits for selenium and 1 of 2 dissolved mercury samples were higher than A&Ww chronic criteria.
MONITORING RECOMMENDATIONS		Low Priority –Use lower lab detection limits for selenium and dissolved mercury.	

FRANCIS CREEK From headwaters to Burro Creek 15030202 -- 012 23.8 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Attaining FBC – Attaining FC – Attaining DWS – Attaining AgI – Attaining AgL – Attaining	Category 1 Attaining all uses	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 10/21/2002 – 09/24/2003 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Above Spencer Creek BWFRA002.33 100556	ADEQ Ambient	4 total and dissolved metals: Antimony, arsenic, beryllium, cadmium, chromium, copper, zinc 4 total metals only: Boron, lead, manganese 6 total and 1 dissolved: mercury	4-5 samples: Ammonia, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen, dissolved oxygen, and pH	4 *E. coli* bacteria 4 Fluoride 4 Total dissolved solids 5 Suspended sediment concentration 5 Turbidity

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Collected all core parameters		Lab detection limits for selenium and 1 of 2 dissolved mercury samples were higher than A&Ww chronic criteria.
MONITORING RECOMMENDATIONS		Low Priority –Use lower lab detection limits for selenium and dissolved mercury.	

KIRKLAND CREEK From Skull Valley to Santa Maria River 15030203 -- 015 22.6 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Attaining FBC – Inconclusive FC – Attaining AgI – Attaining AgL – Attaining	Category 2 **Attaining some uses**	

MONITORING USED IN THIS ASSESSMENT				
SITE NAMES **ID #** **DATABASE #**	**AGENCY** **PURPOSE**	**SAMPLING PERIOD**: 10/23/2002 – 06/25/2003		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Near Ritter's Ranch BWKRK017.08 100408	ADEQ Ambient and TMDL	6 total and 2 dissolved: Mercury 4 total and dissolved metals: Antimony, arsenic, beryllium, cadmium, chromium, copper, zinc 4 total metals only: Boron, lead, and manganese	4 samples: Ammonia, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen, dissolved oxygen, and pH	4 *E. coli* bacteria 4 Fluoride 4 Total dissolved solids 5 Suspended sediment concentration 4 Turbidity
At Yava Bridge BWKRK009.32 102320	ADEQ TMDL			

EXCEEDANCES			
POLLUTANT	**STANDARD UNIT DESIGNATED USES**	**DATES EXCEEDANCES**	**DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS**
E. coli bacteria	235 CFU/100 ml FBC	10/23/2002 – 436 CFU/100 ml	Inconclusive – 1 exceedance during the last 3 years of monitoring.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS			
EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	**MISSING CORE PARAMETERS**	**MISSING SEASONAL DISTRIBUTION**	**DETECTION LIMITS NOT LOW ENOUGH**
E. coli bacteria	**Collected all core parameters**		Lab detection limits for selenium and 1 of 2 dissolved mercury samples were higher than A&Ww chronic criteria.
MONITORING RECOMMENDATIONS		Medium Priority – Collect E. coli bacteria samples due to the exceedance. Use lower lab detection limits for selenium and dissolved mercury.	

KNIGHT CREEK From Wheeler Wash to Big Sandy River 15030201 -- 019 9.9 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Inconclusive FBC – Inconclusive FC – Inconclusive AgL – Inconclusive	Category 3 Inconclusive	

MONITORING USED IN THIS ASSESSMENT				
SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING Dates: 09/19/2004; 10/21/2004		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Above Big Sandy River BWKNI000.53 102311	ADEQ TMDL	2 total only: Mercury	1 sample: Dissolved oxygen and pH	2 Suspended sediment concentration

EXCEEDANCES			
POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Mercury	0.6 µg/L FC	09/19/2004 – 1.94 µg/L 10/21/2004 – 0.96 µg/L	Inconclusive – Both samples collected exceeded standards. (Requires a minimum of 5 exceedances and 20 samples to determine impairment - Binomial)
Suspended sediment concentration	Geometric mean 80 mg/L A&Ww	09/19/2004 – 35,160 mg/L 10/21/2004 – 48,700 mg/L	Inconclusive – Both samples exceeded standards. Flow was measured for only one sample and it was 3.2 cfs. Field notes indicate the other was during high flow conditions of 9-10 cfs, so could not be used in the geometric mean calculation. Insufficient samples to calculate the geometric mean (requires a minimum of 4 samples.)

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS			
EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
Mercury and suspended sediment	Insufficient core parameters	Insufficient monitoring events	
MONITORING RECOMMENDATIONS	Medium Priority –Collect mercury and suspended sediment concentration samples due to exceedances. These mercury samples were collected to support the development of TMDL for Alamo Lake (downstream). These relatively high levels in mercury indicate mercury loading may be coming from this drainage. Collect core parameters to represent at least 3 seasons during an assessment period. The high SSC values indicate heavy sediment transport. Recommend using biocriteria assessments and bottom deposits implementation procedures in this reach, when they are adopted.		

SANTA MARIA RIVER From Little Sycamore Creek to Little Shipp Wash 15030203 -- 013 6.8 Miles	USE SUPPORT	OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A&Ww – Impaired FBC – Inconclusive FC – Attaining AgI – Inconclusive AgL – Inconclusive	Category 5 Impaired	Mercury	Add to the 303(d) List (new 2006).

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 07/31/2003 – 01/05/2005 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Above Highway 96 BWSMR042.16 102318	ADEQ TDML	1 total metals only: Antimony, arsenic, barium, beryllium, boron, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium, silver, and zinc 5 total and 3 dissolved: Mercury	2 Dissolved oxygen 6 pH	6 Suspended sediment concentration 4 Turbidity
Below Highway 96 BWSMR041.23 102319	ADEQ TMDL			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Dissolved oxygen	6.0 mg/L A&Ww	07/31/2003 – 5.0 mg/L	Attaining – Low dissolved oxygen due to natural conditions of low flow and ground water upwelling.
Mercury (dissolved)	0.01 µg/L A&Ww chronic	07/31/2003 – 0.017 µg/L 08/18/2004 – 0.022 µg/L	Impaired – 2 exceedances during the assessment period. Impairment decision supported by downstream impairment on Santa Maria River and at Alamo Lake, and ultra-clean field sampling techniques.
Suspended sediment concentration	Geometric mean 80 mg/L A&Ww	07/31/2003 – 209 mg/L 08/18/2004 – 1042 mg/L 09/19/2004 – 5084 mg/L 10/21/2004 – 480 mg/L 12/29/2004 – 8850 mg/L 01/05/2005 – 365 mg/L	Inconclusive – Exceeded 80 mg/L criterion in all 6 samples collected. High flow conditions were occurring during 4 of the sampling events (5084, 480, 8850, and 365 mg/L), so these values could not be included in the geometric mean calculation. Insufficient values were left to calculate a geometric mean, as a minimum of 4 samples are required.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
Suspended sediment	Insufficient dissolved metals (cadmium, copper, zinc), *E. coli* bacteria, boron, manganese, copper, and lead needed to assess A&Ww, FBC, AgI, and AgL		

MONITORING RECOMMENDATIONS	High Priority – Collect mercury samples to support TMDL development to evaluate effectiveness of TMDL implementation plans and remediation actions for Alamo Lake. Collect suspended sediment concentration samples due to exceedances. The high SSC values indicate heavy sediment transport. Recommend using biocriteria assessments and bottom deposits implementation procedures in this reach, when they are adopted. Collect core parameters to represent at least 3 seasons during an assessment period.

SANTA MARIA RIVER From Bridle Creek to Date Creek 15030203 -- 009 24.5 Miles	USE SUPPORT	OVERALL ASSESSMENT	POLLUTANTS CAUSING IMPAIRMENT	IMPAIRMENT STATUS
	A&Ww – Inconclusive FBC – Attaining FC – Attaining AgI – Attaining AgL – Attaining	Category 2 Attaining some uses		

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 02/14/2000 – 05/17/2005 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Below Highway 93 bridge BWSMR026.65 102306	ADEQ TMDL	34 total and 27 dissolved: Mercury 9-24 total and 6-24 dissolved metals: Antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, nickel, silver, thallium, zinc 24 total metals only: Boron and manganese 1 Selenium	22-34 samples: Ammonia, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen, dissolved oxygen, and pH	23 *E. coli* bacteria 24 Fluoride 225 Total dissolved solids 20 Suspended sediment concentration 31 Turbidity
At Highway 93 bridge BWSMR026.08 100399	ADEQ Ambient			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Dissolved oxygen	6.0 mg/L A&Ww	09/18/2000 – 4.0 mg/L 09/12/2001 – 2.8 mg/L 07/31/2003 – 5.6 mg/L 09/16/2003 – 3.9 mg/L 09/29/2004 – 4.0 mg/L	Attaining – 4 out 5 samples were taken during low flow conditions. Therefore, only 1 exceedance in 28 samples (binomial).
E. coli bacteria	235 CFU/100 ml FBC	05/08/2001 – 390 CFU/100 ml	Attaining – 1 exceedances in the last 3 years of monitoring (17 samples since this one exceedance).
Mercury	0.6 µg/L FC	08/17/2004 – 0.63 µg/L	Attaining – Only 1 exceedance in 34 samples (binomial).
Mercury (dissolved)	0.01 µg/L A&Ww chronic	07/31/2003 – 0.019 µg/L 08/17/2004 – 0.011 µg/L* 09/20/2004 – 0.012 µg/L# 11/10/2004 – 0.011 µg/L#	Inconclusive – 1 exceedance during the assessment period. Flow on 07/31/2003 was 12.7 cfs. *There is no flow data for 08/17/2004, therefore ADEQ cannot confirm this represents an exceedance. #The samples on 09/20/2004 (95 cfs) and 11/20/2004 (501 cfs) were collected during storm flows; therefore, ADEQ did not assume they represented chronic conditions.
Suspended sediment concentration	Geometric mean 80 mg/L A&Ww	07/31/2003 – 322 mg/L 09/10/2003 – 866 mg/L 08/18/2004 – 9362 mg/L 09/19/2004 – 11,820 mg/L 10/21/2004 – 2410 mg/L 11/23/2004 – 850 mg/L 12/29/2004 – 9374 mg/L 02/24/2005 – 490 mg/L	Inconclusive – All exceedances occurred during high flows; therefore these values could not be used in the geometric mean calculation. Geometric mean of the remaining values did not exceed 80 mg/L

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS			
EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	**MISSING CORE PARAMETERS**	**MISSING SEASONAL DISTRIBUTION**	**DETECTION LIMITS NOT LOW ENOUGH**
*S*uspended sediment	Collected all core parameters.		Lab detection limits for selenium and dissolved mercury were higher than A&W chronic criteria in at least 13 samples.
MONITORING RECOMMENDATIONS		High Priority – Collect mercury samples to support TMDL development to evaluate effectiveness of TMDL implementation plans and remediation actions for Alamo Lake. Collect suspended sediment samples due to exceedances. The high SSC values indicate heavy sediment transport. Recommend using biocriteria assessments and bottom deposits implementation procedures in this reach, when they are adopted. Collect core parameters to represent at least 3 seasons during an assessment period.	

TROUT CREEK From Cow Creek to Knight Creek 15030201 -- 014 32.1 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Attaining FBC – Inconclusive FC – Attaining AgL – Attaining	Category 2 Attaining some uses	

MONITORING USED IN THIS ASSESSMENT

SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 02/25/2000 – 09/28/2004 NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Above Divide Canyon BWTRT011.97 100670	ADEQ Ambient	8-21 total and dissolved metals: Antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, nickel, silver, thallium, and zinc 21 total metals only: Boron and manganese 23 total and 16 dissolved: Mercury	20-23 samples: Ammonia, total nitrogen, total phosphorus, nitrite/nitrate, total Kjeldahl nitrogen, dissolved oxygen, and pH	20 *E. coli* bacteria 21 Fluoride 21 Total dissolved solids 10 Suspended sediment concentration 23 Turbidity
Near Wikieup BWTRT002.43 100397	ADEQ Ambient			
At Knight Creek BWTRT000.19 102309	ADEQ TDML			

EXCEEDANCES

POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
Dissolved oxygen	6.0 mg/L A&Ww	06/23/2003 – 5.4 mg/L	Attaining – Low dissolved oxygen due to low flow and ground water upwelling and lack of riffle. Only 1 low DO in23 samples.
E. coli bacteria	235 CFU/100 ml FBC	02/23/2005 – 620 CFU/100 ml	Inconclusive – Only 1 exceedance. Note that the exceedance occurred during flood flow – 1978 cfs, while normal is 1-6 cfs.
Mercury (dissolved)	0.01 µg/L A&Ww chronic	09/20/2004 – 0.039 µg/L	Inconclusive – Only 1 exceedance in the assessment period.
Suspended sediment concentration	Geometric mean 80 mg/L	09/20/2004 – 2031 mg/L	Attaining – Only 1 of 10 samples exceeded the 80 mg/L criterion. It occurred during a high flow event so would not be included in the geometric mean calculation. The remaining samples did not exceed the geometric mean standard.

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS

EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
E. coli bacteria, mercury	Collected all core parameters		Lab detection limits for selenium and dissolved mercury were higher than A&Ww chronic criterion in at least 11 samples.

MONITORING RECOMMENDATIONS	Medium Priority –Collect mercury and *E. coli* bacteria samples due to exceedances. Use lower lab detection limits for selenium and dissolved mercury. The one high SSC value indicates heavy sediment transport. Recommend using biocriteria assessments and bottom deposits implementation procedures in this reach, when they are adopted.

WILDER CREEK From headwaters to Boulder Creek 15030202 – 007 15.3 Miles	USE SUPPORT	OVERALL ASSESSMENT	
	A&Ww – Inconclusive FBC – Inconclusive FC – Inconclusive	Category 3 Inconclusive	

MONITORING USED IN THIS ASSESSMENT				
SITE NAMES ID # DATABASE #	AGENCY PURPOSE	SAMPLING PERIOD: 11/29/2000 – 12/31/2001		
		NUMBER AND TYPES OF SAMPLES		
		Metals	Nutrients – Related	Other
Above Boulder Creek BWWLD000.10 101014	ADEQ TMDL	8 total and dissolved metals: Arsenic, beryllium, copper, lead, manganese, and zinc	6 Dissolved oxygen and 7 pH	None

EXCEEDANCES			
POLLUTANT	STANDARD UNIT DESIGNATED USES	DATES EXCEEDANCES	DESIGNATED USE SUPPORT SUPPORTING EVIDENCE AND COMMENTS
No Exceedances			

Pollutant: Assume "total" concentration, unless shown as dissolved.
Frequency Exceed = Samples collected within a 7-day period are aggregated and counted as one sample per site.

DATA GAPS AND MONITORING NEEDS			
EXCEEDANCES NEEDING MORE SAMPLES TO ASSESS	MISSING CORE PARAMETERS	MISSING SEASONAL DISTRIBUTION	DETECTION LIMITS NOT LOW ENOUGH
	Insufficient dissolved cadmium, *E. coli* bacteria, and mercury to assess the designated uses.		Lab detection limits for dissolved copper and lead were higher than chronic A&W standards in at least 4 samples each.
MONITORING RECOMMENDATIONS		Low Priority –Collect core parameters to represent at least 3 seasons during an assessment period. Use lower lab detection limits for dissolved lead and dissolved copper	